



**Program Executive Office  
Command, Control, Communications,  
Computers and Intelligence (PEO C4I)**

# **Afloat Networks ASNE Combat Systems Symposium**

**March 2012  
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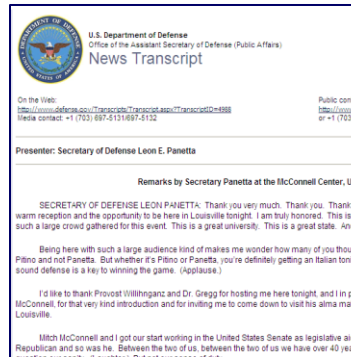
***Information Dominance  
Anytime, Anywhere...***



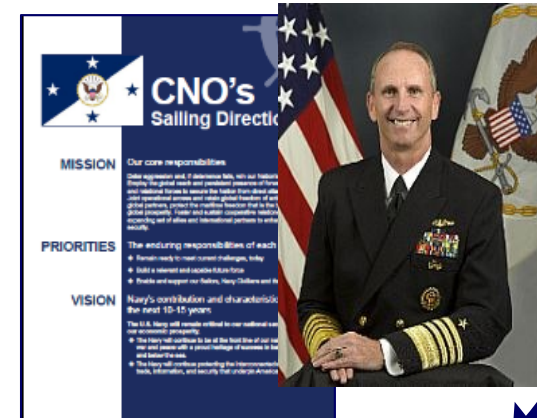
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# Bandwidth = Time = Battlespace



Proceedings Magazine, "Lead or Get Out of the Way: Winning the Millennium War," VADM Mark Edwards, US Navy, April 2008,



- We must continue to invest in new capabilities like cyber and unmanned systems and space...
- I have to tell you that I do worry, however, about this new area I talked about of cyber-war.
- I think the capabilities are available in cyber to virtually cripple this nation, to bring down our power grid system, to impact on our governmental system, to impact on our -- on Wall Street, on our financial systems, and to literally bring -- paralyze this country.
- So the one thing that I worry about the most right now is knowing that this is possible and feeling that we have not taken all the necessary steps to protect this country from that possibility.

- Over the next 10-15 years, the Navy will evolve and remain the preeminent maritime force.
  - The reach and effectiveness of ships and aircraft will be greatly expanded through new and updated weapons, unmanned systems, sensors, and increased power.
  - Unmanned systems in the air and water will employ greater autonomy and be fully integrated with their manned counterparts.
  - Cyberspace will be operationalized with capabilities that span the electromagnetic spectrum -- providing superior awareness and control when and where we need it.



# PEO C4I End to End Capability Early – Mid 90's



## RF Bandwidth

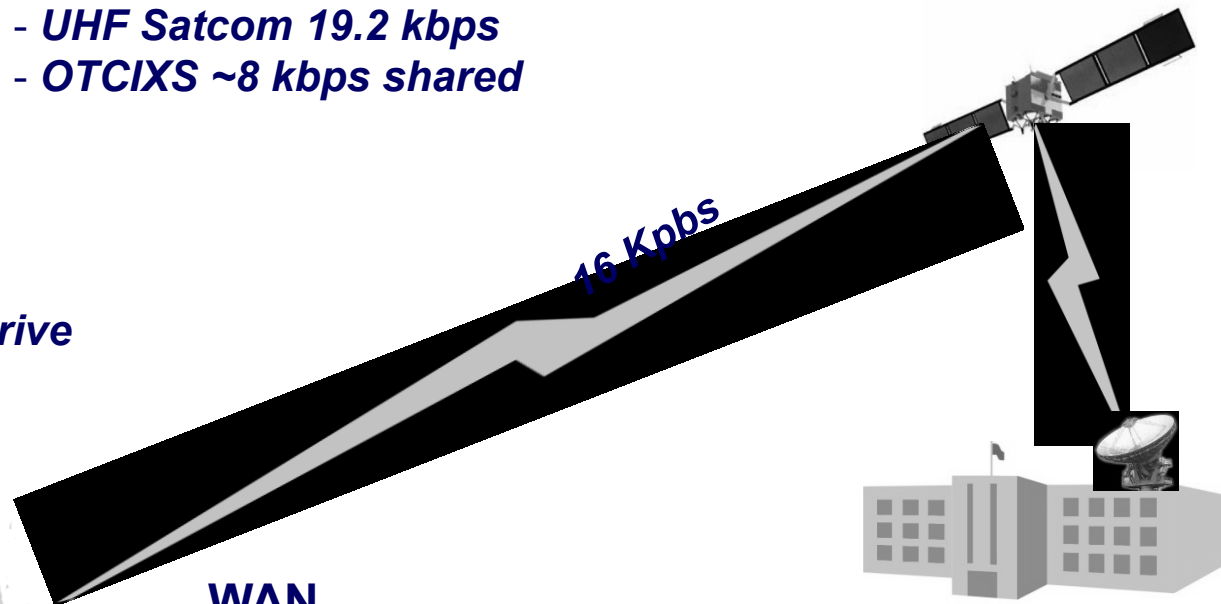
- *Inmarsat 16kbps*
- *SHF voice (CMD Ships) 16 kbps*
- *UHF Satcom 19.2 kbps*
- *OTCIXS ~8 kbps shared*

## Network Storage

- *JOTS/JMCIS: 20 MB Hard drive*

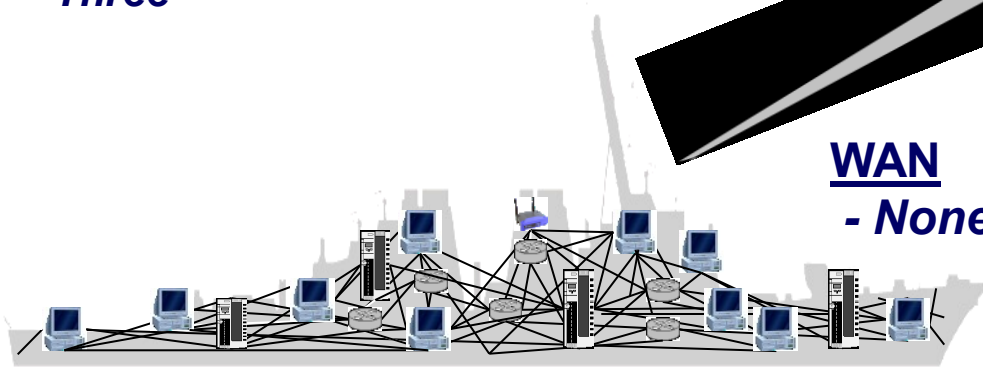
## Applications

- *Three*



## WAN

- *None*



SHF – Super High Frequency  
EHF – Extremely High Frequency  
OTCIXS - Officer in Tactical Command Information Exchange Subsystem  
JOTS – Joint Operational Tactical System  
JMCIS – Joint Maritime Command Information System

***Required Bandwidth achieved via helicopter – Navy disadvantaged and nearly kept out of the game....***



# PEO C4I End to End Capability 2010's



## RF Bandwidth (up from 16 Kbps)

- Inmarsat 16kbps
- SHF up to 7 mbps
- EHF 1.5 mbps
- UHF Satcom 48 kbps
- GBS (rcv only) 45 mbps
- CWSP/CBSP up to 21 mbps

## Network Storage

**Common Computing Environment (ISNS):**

**20 TB storage per enclave (up from 20 MB Hardrive)**

**CANES: 9.5 TB for apps alone**

## Applications

- Over 800 Connected or hosted (up from 3)

## WAN (ADNS)

- 25 / 50 mbps

CANES – Consolidated Afloat Networks and Enterprise Services

ISNS – Integrated Shipboard Network System

ADNS – Automated Digital Network System

SHF – Super High Frequency

EHF – Extremely High Frequency

GBS – Global Broadcast System

CWSP/CBSP – Commercial Wideband Satellite Program/Broadband

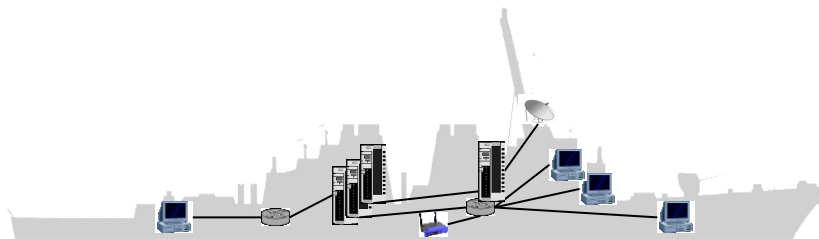
**...now Supports Full Motion Video, persistent COP, ISR Data Management and full array of Warfare**



# PEO C4I End to End Capability



Capability	Current Systems	Future Technology
Local Area Network	<ul style="list-style-type: none"> <li>- Integrated Shipboard Network Systems (ISNS)</li> <li>- Submarine LAN (SubLAN)</li> <li>- Combined Enterprise Regional Information Exchange System – Maritime (CENTRIXS-M)</li> <li>- Sensitive Compartmented Information Networks (SCI Net)</li> </ul>	<ul style="list-style-type: none"> <li>- Consolidated Afloat Networks and Enterprise Services (CANES)</li> </ul>
C2 Application	<ul style="list-style-type: none"> <li>- Global Command and Control System – Maritime (GCCS-M)</li> <li>- Naval Tactical Command Support System (NTCSS)</li> <li>- Distributed Common Ground System - Navy (DCGS-N)</li> </ul>	<ul style="list-style-type: none"> <li>- Maritime Tactical Command and Control System (MTC2)</li> <li>- NTCSS</li> <li>- DCGS-N</li> </ul>
Wide Area Network	<ul style="list-style-type: none"> <li>- Automated Digital Network System (ADNS) Increments I, II, III</li> </ul>	<ul style="list-style-type: none"> <li>- ADNS Inc III</li> <li>- ADNS Inc II (Airborne)</li> </ul>
Communications	<ul style="list-style-type: none"> <li>- Super High Frequency (SHF)</li> <li>- Navy Extremely High Frequency Program (NESP)</li> <li>- Global Broadcast System (GBS)</li> <li>- Commercial Wideband Satellite Program (CWSP)</li> <li>- Commercial Broadband Satellite Program (CBSP)</li> <li>- Battle Force Tactical Network (BFTN)</li> </ul>	<ul style="list-style-type: none"> <li>- Navy Advanced EHF Multiband Terminal (NMT)</li> <li>- CBSP</li> <li>- GBS</li> <li>- BFTN</li> </ul>





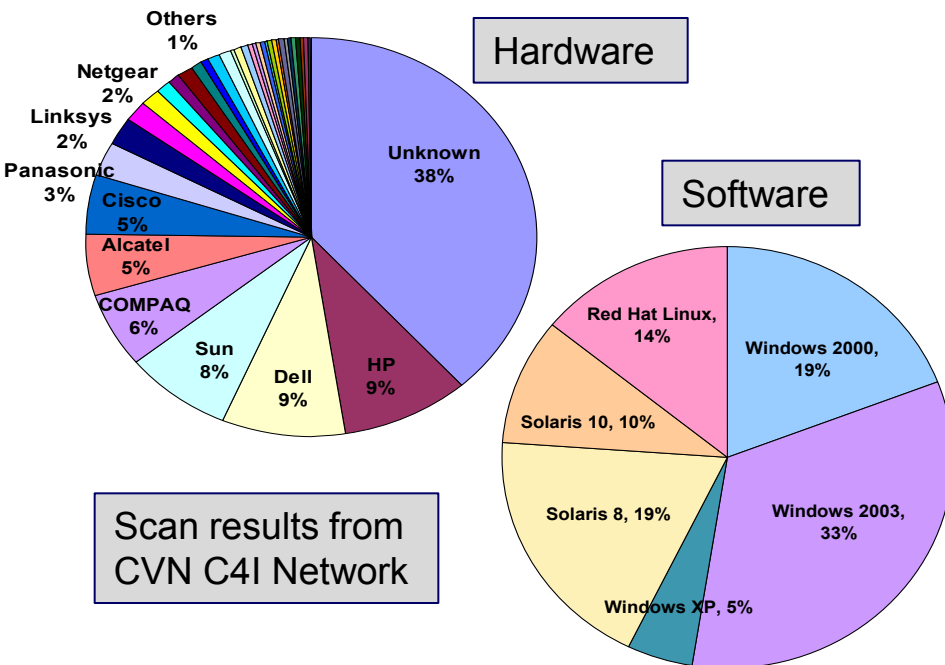


# Network Development

## Status Quo

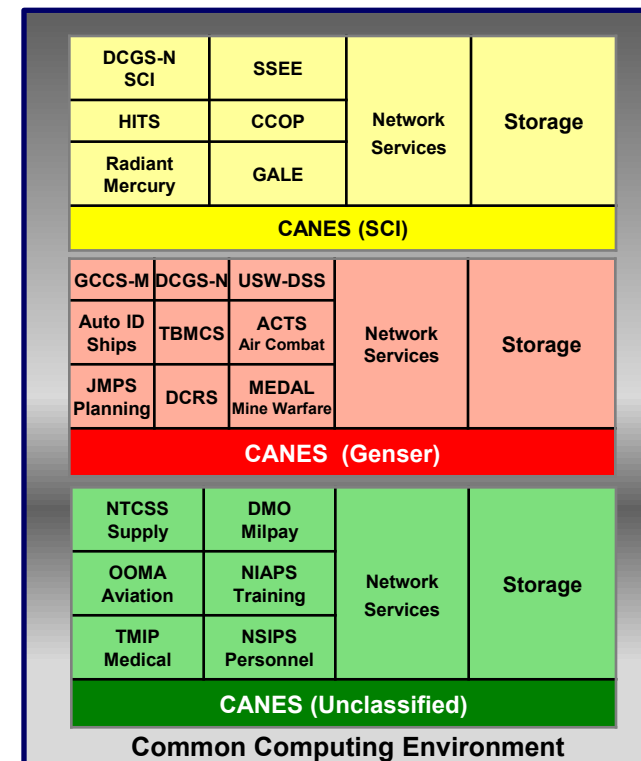
- Multiple security vulnerabilities
  - Inadequate levels of information security / network readiness
- Multiple unique networks & h/w variants
  - 642 legacy variants on 300+ platforms
- Multiple Operating Systems and versions
- Inefficient use of server/storage resources

***Across multiple security enclaves***



## CANES

- Common Computing and Software Environment
- Cross Domain Solutions (CDS)
- Systems Management
- Technology Refresh





# ADNS Evolutionary Development



Increment I		Increment II		Increment IIa/IIb		Increment III	
1997-2005				2004- 2010		2009- 2020	
RF links	IP over single RF Link		IP over dual RF Links		IP over Several (no limit) RF Links		
Throughput	ADNS						
	Bandwidth limited to 1.5Mbps		6Mbps Aggregate (2Mbps/channel)		16Mbps Aggregate (8Mbps/channel)		25/50Mbps Aggregate
Converged IP	ADNS feeds into Static TDM (Timeplex) Network			Eliminates need for TDM (Timeplex). Voice, Video, and Data transported through ADNS (Converged IP realized). Increases Dynamic Bandwidth IP Management			
QoS	Baseline Routing, Encryption, & Network Management Based System with Fixed Bandwidth		Application Prioritization, Minimum Bandwidth Guarantees, and Static Traffic Distribution			Enhanced QoS through Optimized Edge Routing (OER), Granular Application Prioritization at Enclave Levels, Minimum Bandwidth Guarantees, and Dynamic Traffic Distribution across multiple RF links	
Reliability/ Efficiencies	Supports Email, Web Browsing, File Transfer, & Multiple Security Level Enclaves		Automatic Failover and Restoral of RF links		Compression, High Speed Pier (IIa only), LM 5.0 (Linux, IIb only), Automatic Failover and Restoral of RF links		Acceleration, NETOPS (Linux), Compression, High Speed Pier, NOC Fail-Over, IPv4/IPv6 Dual Stack, Automatic Failover and Restoral of RF links
Transport	Secret core					Ciphertext Core	

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ADNS





# Navy SATCOM Capability Growth



## Desert Storm c. 1990

Inmarsat - A  
SALTS (logistics)/FAX  
Official Phones  
2.4-16 kbps

SHF  
Voice @ 16 kbps  
(Command Ships Only)  
16 kbps

UHF  
"Dual DAMA"  
8 2.4 kbps  
Circuits  
(25kHz only)  
Secure Voice/Data  
Netted Comms  
19.2 kbps



Navy barely in the game

## Post Desert Storm

- 1992 "QUICKSAT" SHF for CVNs
- 1994 ORDs define WB SATCOM requirements



### Aggressive fielding schedules deliver:

- WB MILSATCOM for all Surface Combatants
- WB Commercial SATCOM (CWSP) augmentation for Large-decks
- Inmarsat-B HSD for others

...getting into the game

## Today

UHF  
"Quad DAMA"  
16 2.4 kbps  
Networks  
(25kHz only)  
Secure Voice/Data  
Netted Comms  
48 kbps

SHF  
JWICS  
SIPRNET  
NIPRNET  
VTC  
POTS  
MSG TRAFFIC  
CHAT  
384 kbps – 12 Mbps

EHF MDR  
JWICS  
SIPRNET  
NIPRNET  
MDU's  
BMD Net  
SECURE  
VOICE/DATA  
4.8 – 1544 kbps

EHF LDR  
24 LDR Channels  
8 Primary  
(2.4 kbps)  
8 Secondary  
(300 bps)  
8 RCV Only  
(2.4 kbps)  
MDU's, S-TADIL-J  
Secure Voice/  
Data  
21.6 kbps

24 – 45 Mbps  
GBS  
(Receive Only)  
UAV Video  
CNN/FOX NEWS  
Imagery (Weather/Intel)  
Web Site Replication  
(classified/unclassified)  
Immediate File Delivery (IFD)

128 kbps  
Inmarsat - B  
HSD  
NIPRNET  
SIPRNET  
JWICS  
POTS  
FAX

1.544 - 2.048 Mbps  
CWSP/CBSP  
JSIPS/JCA  
JWICS  
SIPRNET  
NIPRNET  
VTC  
POTS  
MSG TRAFFIC

3.6 Mbps  
TV Direct to Sailors  
(Receive Only)  
News  
Sports  
Entertainment  
3 Radio Channels  
1 Data Channel

...staying in the game.



# Some Thoughts on Future Command, Control, Communications, Computers and Intelligence Capability and Capacity



**Rapidly Evolving Requirements Drive Navy Capability Advancements**

**Operational Environment**

- Humanitarian Assistance
- Short and Medium Range Ballistic Missiles
- Complex Threats Employing Advanced Technology in Challenging Environments
- Sub-Sonic Anti-Air & Anti-Surface Missiles
- Super-Sonic Anti-Air & Anti-Surface Missiles
- Advanced Super-Sonic Anti-Air

**Force Integration**  
**Force Level Sensor & Weapons Coordination**

- Integrated Force Level Kill Chain
  - Coordination of Netted Force Operations to Counter Mid-Term Threats
  - Joint Weapons and Sensors Coordination to Counter Far-Term Threats

**Improved Mission Capability**  
**Enabling**

**Future DoD IT Environment**

Reduced costs for data centers and applications	Improved interoperability for better coordination and collaboration	Improved user satisfaction and mission success
Faster, more responsive capability deliveries to Warfighters	Improved security to reduce cyber threats	Faster adoption of commercial IT breakthroughs

Reference: DOD CIO

## Future C4I Capability and Capacity drivers?

- Cyberspace Operationalization
- Cyber Defense
- Broad Area Maritime Surveillance (BAMS)
- UAVs, USVs, UUVs
- LCS and Mission Modules
- Remote Sensors
- Maritime Aerial Layer Network
- Full Motion, High Resolution Video
- Advances in Computer Technology
- Advances in Network Technology
- Network and System Management
- Competition for Bandwidth
- Application Proliferation
- New ISR sources
- Advances in Waveforms
- Growth of Adversary Capabilities
- Growth of Coalition/Partner Capabilities
- Budget and Fiscal Realities
- Others????



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